X-ray Image Logger Quick Start Guide

Introduction

This guide is written to help guide scientists and technicians in setting up for and collecting x-radiographs IMS version 10.2. For more detailed information regarding the XMSL- IMS software, image processing, and the XMSL hardware, please refer to the XMSL-IMS User guide.

Launching the IMS X-ray Imager application

The IMS XMSL software can be launched from the Windows Start menu or from the desktop icon (**Figure 1**).

Figure 1- XMSL Desktop Icon

At launch, the program begins the following initialization process:

- Testing instrument communications
- Homing the pusher arm of the motion control system
- Verifying Dark and Light Calibration images. If the calibration images are not found, the program will ask the user to run a calibration.

After successful initialization, the main IMS-XMSL window will appear (**Figure 2**).
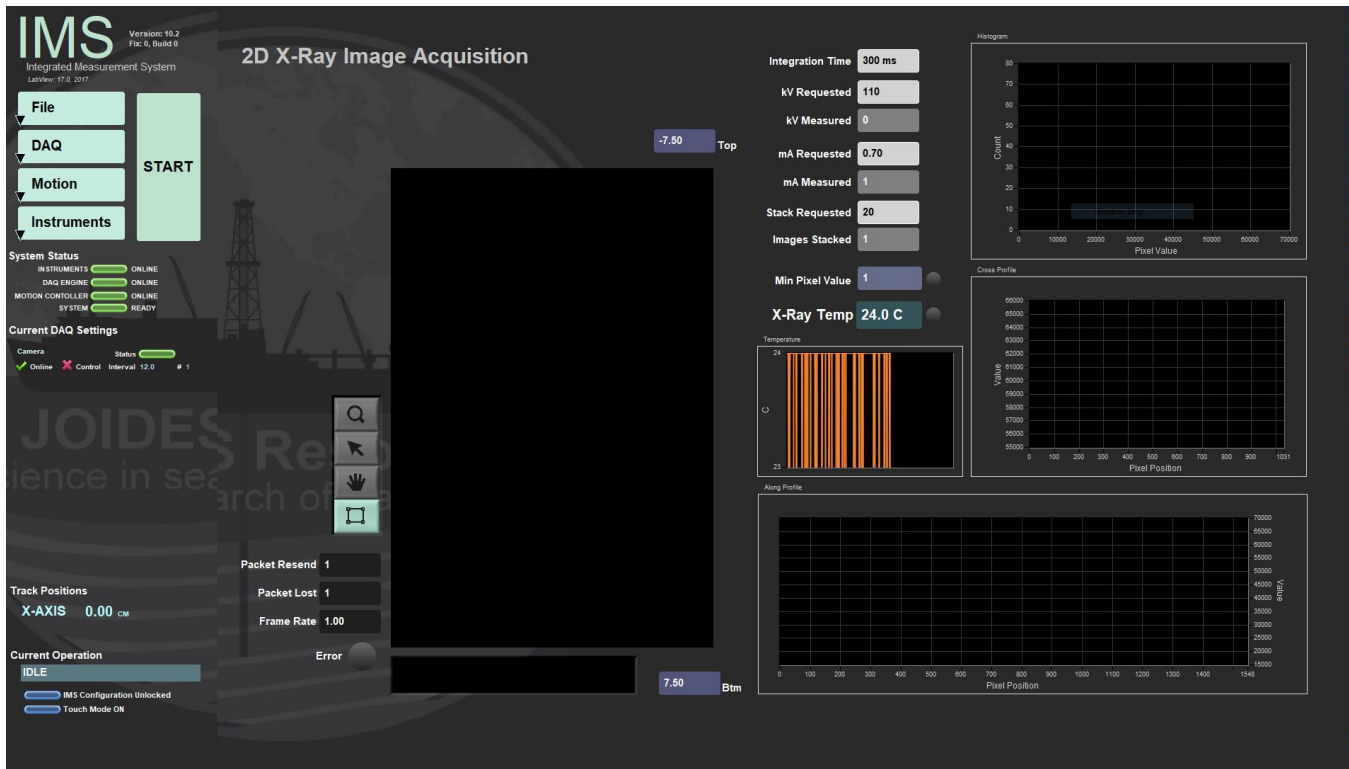
Figure 2- XMSL IMS Main Window

Preparing For Imaging

Prior to imaging cores, especially at the start of an expedition, the user must:

1. Perform a detector calibration. (*Detector Calibration Section*)
2. Test the exposure parameters in the imaging utility (*Imaging Utility Section*)
3. Set the exposure parameters in the Measurement Editor (*XMSL DAQ Parameters section*)
4. Adjust the automatic image processing settings. (*Image Processing Section*)

Note: Recalibrate the detector if the detector grid pattern becomes visible in the images.

Once these steps are complete, the user may begin imaging.

Set Exposure Parameters

Prior to collecting x-radiographs on whole rounds or section halves in the XMSL, the user must set the imaging parameters (voltage, exposure, current). For explanation on how to test exposure parameters prior to imaging, see the *Image Utility* section. For explanation on how to test image processing parameters, see the *Image Process Utility* section.

To open the Measurement Editor (**Figure 3**), select **DAQ > Measurement Editor** from the IMS panel menu. This window allows the user to view and adjust the XMSL DAQ parameters.

- **Interval:** Number of centimeters the core will move between each image. This value is hardcoded in the IMS software and cannot be changed in this window. This interval guarantees image overlap, but maximizes system efficiency.
- **Width:** This is the fixed length of the image produced. This value is dependent on the detector and hardware setup. Each image is 15 cm in length, but due to projection, we see less than 15 cm of the core section in the image. For example, with 12 cm of motion, we are seeing 12 cm of core in a 15 cm image.
- **Stack:** The number of x-radiographs to take at each position. These images are stacked and averaged to produce the final raw image. Twenty images is the standard as stacking more images does not appear to improve the image quality further. See *Image Stacking* section for more explanation.
- **Exposure Time:** The duration of each exposure in milliseconds.
- **kV:** X-ray tube voltage. Maximum voltage for the source is 120 kV. Lowering the voltage while maintaining the number of x-rays penetrating the core (longer exposure or higher current) will increase image contrast.
- **mA:** X-ray tube current. Maximum current for the source is 1 mA. Increasing the current will increase contrast if voltage is kept constant.

Each of the stacked images is taken with the exposure time, kV, and mA set in this window. To estimate the length of time it takes for each image at specific settings, multiply the exposure time by the number of stacked images.
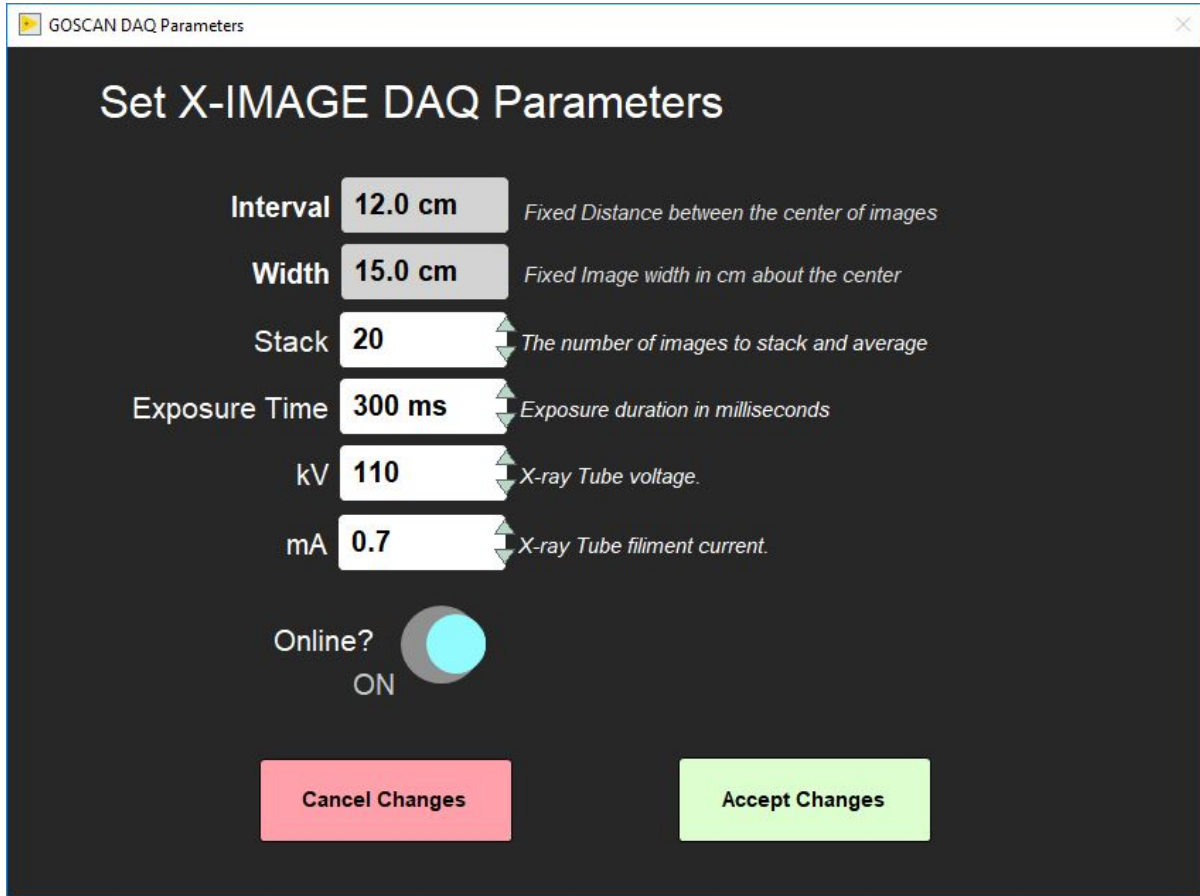
Figure 3- XMSL Measurement Editor Window

Once the parameters are set click 'Accept Changes'. To revert any changes back to the original settings click 'Cancel Changes'.

Start Imaging

Sample Information Window

Click **START** on the IMS panel (**Figure 2**) to open the sample information window (**Figure 4**). This is where the user enters the sample ID for a section and initiates the measurement. There are three tabs available on the sample information screen. Each provides a different method for entering the sample ID information.
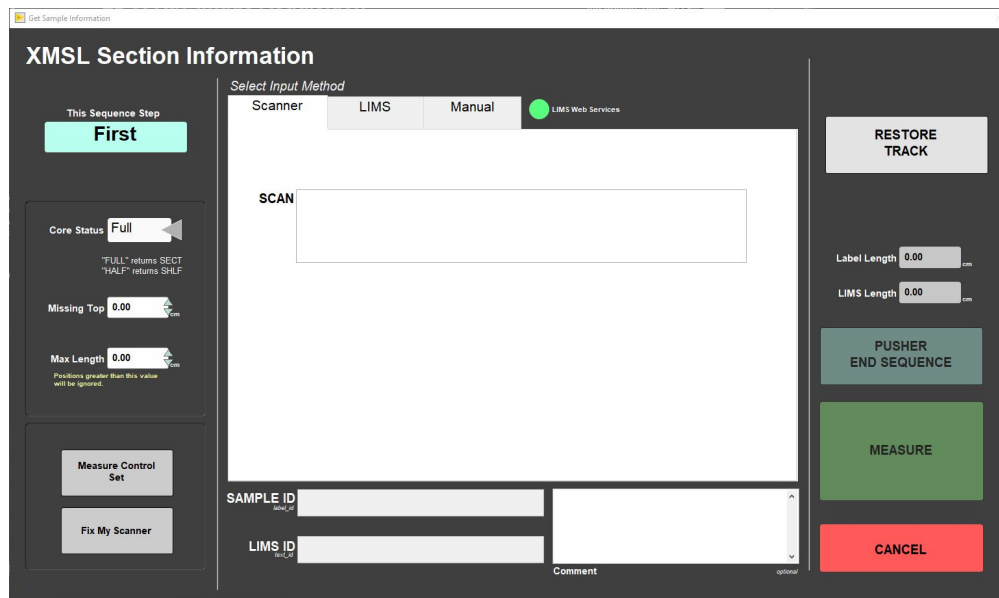
Figure 4- Sample Information Window- Scanner entry (left), LIMS entry (middle), and Manual Entry (right).

Taking X-radiographs

1. Select **START** on the IMS panel (**Figure 2**) to open the sample information window (**Figure 4**).
2. Enter the Sample ID Information

- **Scanner** mode: <u>Place cursor in the scan box;</u> scan the IODP barcode from the whole round or the section half label from the end cap.
- **LIMS** mode: Select a section using the hierarchy columns.
- **Manual** entry mode: Type in the sample label ID (i.e., 362-U1480A-1H-1-A) and LIMS Text ID (i.e., SHLF7851761) and length of section. Use the whole round id when imaging whole rounds.

- Any entry will be accepted, but that does not guarantee the data will upload. The Text ID information must match an actual section in order for the data to upload.
- Select **USE ME** to update the IDs and enable the **MEASURE** button.

3. Ensure the **Core Status** (left side of window) is set to match the type of core being imaged

    a. Full= Whole round
    b. Half= Section half

4. Ensure the section half is inside the load end door and that all doors are closed.

    a. The green and yellow light on top of the lead box should be illuminated

5. Select **MEASURE**

    a. The motion control pusher will move until the section breaks the top of core switch beam.
    b. The x-ray source will ramp up and a window with the x-ray source status will appear (**Figure 5**). Once the mA and kV are stable, the window will close and image acquisition will begin. The user may abort at any time by clicking the **Abort** button.
        i. Once the top of core is located, the pusher will automatically move the section to the proper location over the detector and begin imaging. The user interface will have a display as shown in **Figure 6**.
        ii. The system will automatically take images along the section until the actuator reaches its limit switch, at which time it will return to the home position and the source will ramp down.
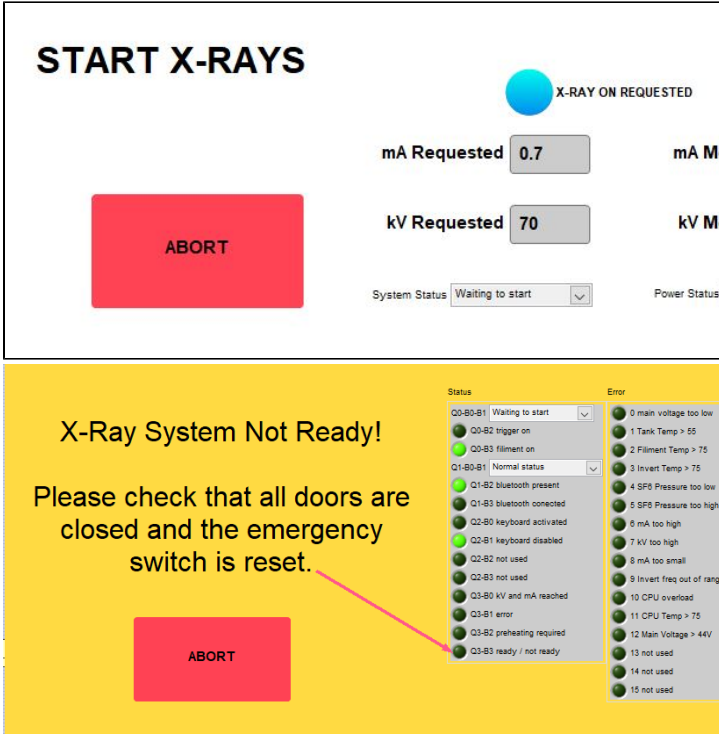
Figure 5- X-ray Status Window (left). As the source ramps up, the measured values will update. X-ray system not ready window (right). If the source is not ready to ramp up this window will be displayed. Normally, this indicates that a door is open. If the doors are not open, look at the values in the status displays and refer to the vendor's manual to determine the issue. As soon as the issue is cleared, this window will close and the x-ray start process will resume.
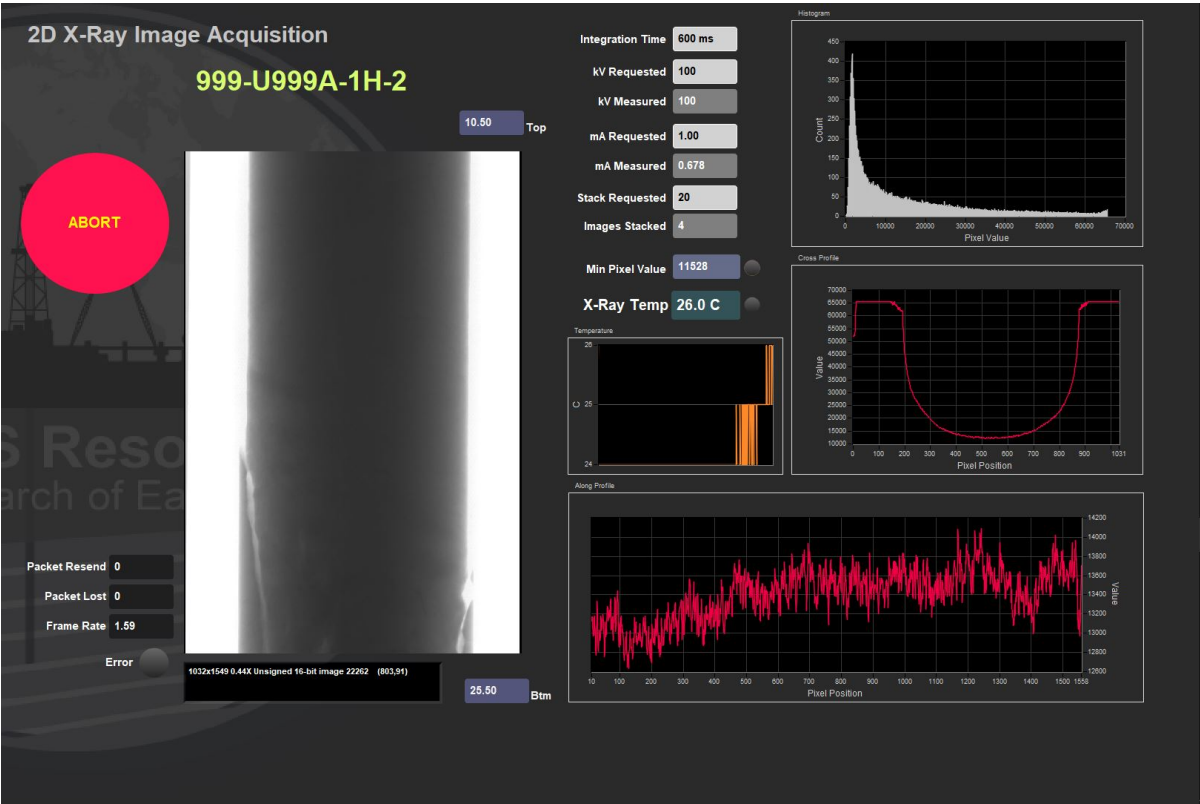
Figure 6- IMS Display During Imaging. Main features of this window include: Abort button, raw image display, imaging parameters display, X-ray source temperature graph, histogram of pixel value and displays of the pixel values along the length and width of the image.

6. The Sample ID information window will reappear on the screen (**Figure 7**).

    a. Place the Pusher section onto the track.

        i.   The pusher should be an empty liner with tape along the top and bottom edges, not the water core from the WRMSL track.

        ii. Close the load end door.

        iii. Select Pusher end sequence in the Sample ID window. The source will ramp back up and the motion control system will continue to push the section through the x-ray system.
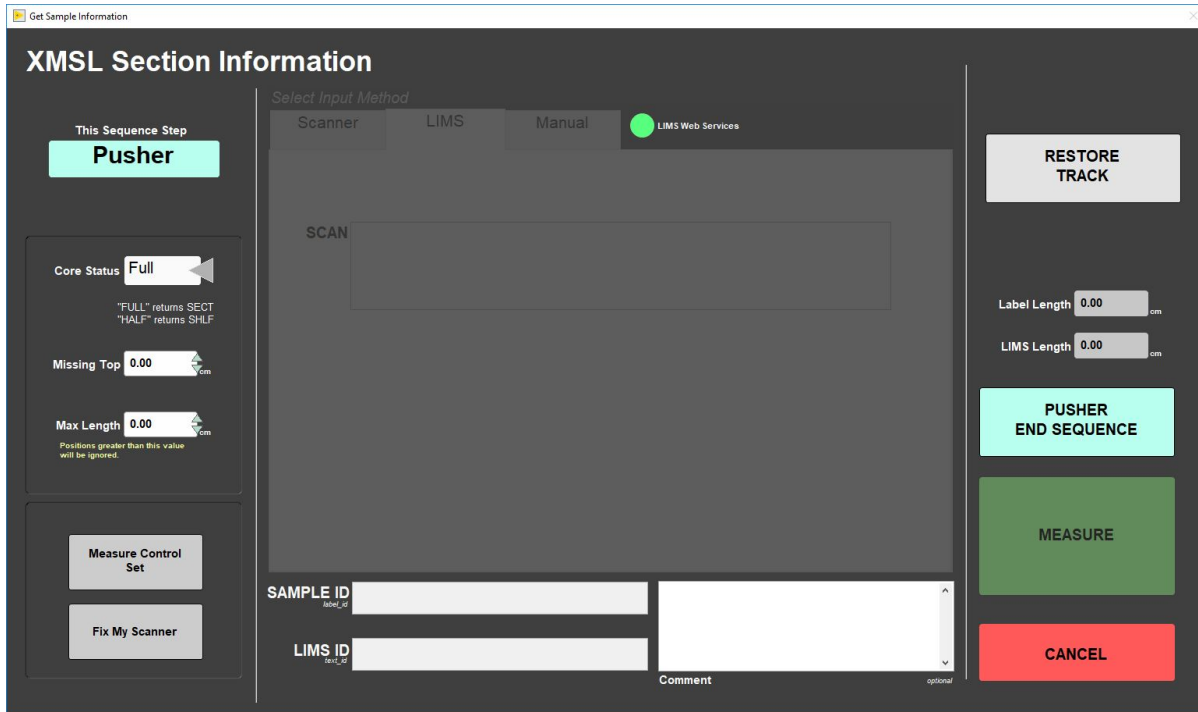

Figure 7- Sample Information Window- Pusher End Sequence View

When the imaging is complete, IMS will automatically process the raw images and output them to the AUX_DATA folder. These are not the primary processed images, but are available for quick image evaluation. The raw images output to the DATA > IN Folder. For more information on IMS image processing, see the *Automatic Image Processing* section in the user guide.

X-Rays OFF

Figure 8 will be displayed when the X-ray Off command is sent to the CP120 source. The window will be displayed until the kV has been confirmed to be at zero.

You will also see this window flash on during X-Ray START when the CP120 fails to respond to the start command. The X-ray off will reset communications with the CP120 and bring it to a known state which will clear any communication issue.
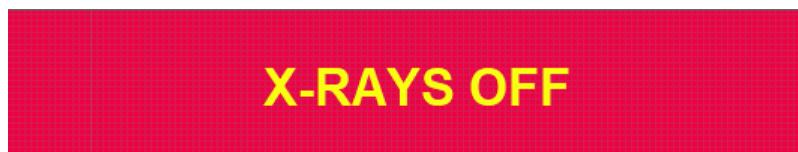

Figure 8- X-ray Off Status Window

NOTE: During imaging, the user can use the software abort button to end the imaging process and ramp down the source. The abort button is available when the x-ray source is ramping up and during the imaging process.

If the abort button is used, a dialog window will appear (**Figure 9**). Once pressed, imaging will end and the user will need to start imaging the section from the beginning. Dialog window options are:

Return to Load Position: Actuator returns to the home position. User will need to manually remove core

Stop and Do Nothing: Actuator will remain in place. Use this option if the section had jammed in the XMSL or is there is a hardware issue.
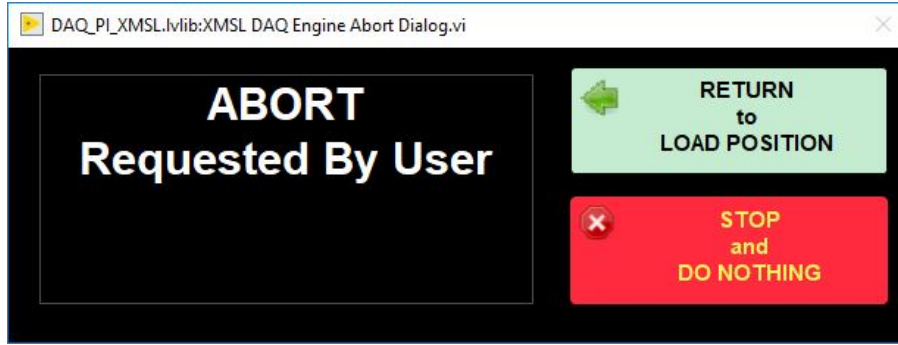

Figure 9- Dialog when after user selects abort during imaging. The x-ray source will automatically ramp down once abort is selected. The section in the imager will need to be restarted from the beginning once abort is selected.

Archive Versions

- X-ray Image Logger QSG - 25022020